

REMARKS/ARGUMENTS

Reexamination of the captioned application is respectfully requested.

A. SUMMARY OF THIS AMENDMENT

By the current amendment, Applicants basically:

1. Amend claims 1, 21 and 33.
2. Cancel claims 26 and 37 without prejudice or disclaimer.
3. Respectfully traverse all prior art rejections.

B. AMENDMENTS TO THE CLAIMS

Independent claim 1 has been amended to recite that in view of a vertical direction with respect to a surface of the insulating substrate, the pixel electrode, the interlayer insulating film, the light-shielding film, and the signal line are provided in this order. The amendment is amply supported by the original disclosure, including the drawings.

Independent claim 21 has been amended to include limitations of (now cancelled) dependent claim 26.

Independent claims 21 and 33 have both been amended to recite that an upper limit of the size of the gap is 15 μm . This amendatory limitation is supported, e.g., by the paragraph bridging pages 24 and 25 of the specification.

C. PATENTABILITY OF THE CLAIMS

Claims 1, 4, 6, 8 and 20 stand rejected under 35 USC 103(a) as being unpatentable over U.S. Patent 6,259,200 to Morita et al in view of AAPA (page 1, line 8 to page 9, line 2 of the specification and Figs. 12 and 13). Claims 3, 5, 7 and 9 stand rejected under 35 USC 103(a) as being unpatentable over U.S. Patent 6,259,200 to Morita et al in view of

AAPA (page 1, line 8 to page 9, line 2 of the specification and Figs. 12 and 13) and further in view of U.S. Patent 6,396,470 to Zhang et al. Claims 19, 21, 25-26, 33-34 and 36-37 stand rejected under 35 USC 103(a) as being unpatentable over U.S. Patent 6,259,200 to Morita et al in view of AAPA (page 1, line 8 to page 9, line 2 of the specification and Figs. 12 and 13) and further in view of U.S. Patent 5,446,562 to Sato. All prior art rejections are respectfully traversed for at least the following reasons.

The independent claims require that "the interlayer insulating film is provided on the light shielding film". In contrast, Morita (US 6,259,200) is such that: the light-shielding film 5 is provided below the signal line 10, and the Morita light-shielding film 5 and Morita signal line 10 are not and cannot be in contact with each other. In case of providing the light-shielding film 5 below the signal line 5 in the manner of Morita, a planarizing film (insulating film.) for compensating for bumps caused by the light shielding film 5 has to be provided between the light-shielding film 5 and the signal line 10 even if the light shielding film 5 has an insulating property. Thus the insulating film is required between the light-shielding film 5 and the signal line 10 in case the light-shielding film 5 is made of metal. However, in the case in which the light-shielding film 5 has an insulating property, the light-shielding film 5 is inferior to metal in terms of light-shielding property, so that the thickness of the light-shielding film 5 has to be increased in order to obtain the same light-shielding performance as in the case of using metal. Accordingly, the thickness of the insulating film between the light-shielding film 5 and the signal line 10 also increases. As a result, there is a greater level difference in a part where the signal line 10 and the light-shielding film 5 do not overlap each other (in Fig. 4, for example) so that the signal line 10 is more likely to be cut. Thus, it is not practical to use Morita's light-shielding film 5 as the insulating film.

In contrast, as apparent from Fig. 1 and the like, Applicants' light shielding film (8) is formed on the signal line (2), and the interlayer insulating film (15) is formed on

the light shielding film (8), so that the interlayer insulating film (15) provided in contact with the light shielding film (8) can planarize the surface of the light shielding film (8) even if the thickness of the light shielding film (8) is increased. Moreover, interlayer insulating film (15) is provided so as to increase the aperture and is not additionally provided for planarization of the light shielding film (8) unlike Morita.

Thus, according to Applicants' independent claim 1, for example, it is possible to provide an "area in which a voltage is not applied to a liquid crystal layer positioned between the signal line and the pixel electrode in applying a voltage to the pixel electrode" while suppressing the possibility that the signal line 10 may be cut. This effect could not be obtained even by combining Morita and the allegedly admitted prior art

Further, in Morita, the light-shielding film is manufactured of the same material as that of the gate line. In Morita, col. 2, lines 61-65, it is described that "Since the light-shielding film is manufactured of the same material as that of the gate line, the light-shielding film is produced without increasing the number of photomasks in the semiconductor process". However, if the light-shielding film is an insulator, the foregoing effect cannot be realized.

The office action argues that U.S. Patent 5,446,562 to Sato is relevant to the above-quoted gap size limitations, and that it would be obvious in view of Sato to optimize the gap of Morita "to a value in accordance with display unevenness to provide for the best display characteristics possible". Applicants disagree.

Sato (US 5,446,562) discusses (see, col. 1, lines 59-63) a problem caused by a coupling capacitance. Sato does not regard a difference (deviation) in a parasitic capacitance in a display area as a problem and does not consider $\Delta\Delta\beta$. Further, in Sato, col. 1, line 64 to col. 2, line 5, it is pointed out that unevenness of liquid crystal alignment

occurs in 7 to 15 μm away from the signal line. Thus, in sufficiently increasing the gap between the signal line and the pixel electrode as a solution of this problem, the gap between the signal line and the pixel electrode has to be greater than 15 μm . Moreover, Sato describes that increase of the gap between the signal line and the pixel electrode causes the aperture to drop which results in a darker display state. Thus, in Sato, a conduction film is provided between the signal line and the pixel electrode via the insulating film as in claim 1.

As explained above, the invention of Sato was made in view of a display problem different from the problem which is to be solved by Applicants' technology. This shows that both the solution of the problem pointed out by Sato and suppression of drop of the aperture cannot be realized even if the gap between the signal line and the pixel electrode is increased. Sato does not teach that the gap between the signal line and the pixel electrode is set to 1 μm or more and 15 μm or less to obtain the desired $\Delta\Delta\beta$ so that uneven display caused by deviation of a parasitic capacitance (a problem solved by Applicants) can be sufficiently improved and drop of the aperture can be suppressed while improving the uneven display. Nor does Morita disclose the size of the gap.

D. MISCELLANEOUS

In view of the foregoing and other considerations, all claims are deemed in condition for allowance. A formal indication of allowability is earnestly solicited.

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Should the Examiner feel that an interview with the undersigned would facilitate allowance of this application, the Examiner is encouraged to contact the undersigned.

TSUBATA, T. et al.
Serial No. 10/717,917

Atty Dkt: 1035-482
Art Unit: 2629

Respectfully submitted,

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